

# Curriculum Vitae

**Name:** Eira Tuulia Seppälä

**Contact address:** Lawrence Livermore National Laboratory  
7000 East Avenue, L-415  
Livermore, CA 94550, USA  
Phone: +1 (925) 422-8179, Fax: +1 (925) 422-6594  
E-mail: Eira.Seppala@llnl.gov

## Work experience:

8/2001 - , University of California, Lawrence Livermore National Laboratory, CA.

*Post-doc staff researcher.*

- Dynamic fracture in metals. Atomistic molecular dynamics simulations of plasticity, specifically dislocations and void growth, in metals under strain.
- Statistical physics of polycrystalline fracture.
- Development of molecular dynamics method, especially parallelization.
- Principal Investigator for a polycrystalline fracture project, which was granted in a LLNL Laboratory Wide LDRD competition.

6/1994 - 8/2001, Laboratory of Physics, Helsinki University of Technology, Finland.

*Researcher (6/2001 - 8/2001), PhD student (2/1997 - 6/2001), teaching assistant (9/1994 - 5/2000), undergraduate research student (6/1994 - 2/1997).*

- Statistical physics: Studies of ground states, phase transitions, interfaces, and wetting phenomena in random Ising magnets; fracture and percolation in random systems.
- Simulations of physical properties of paper.
- Graph-theoretical optimization algorithms applied to disordered systems. Parallelization of the optimization algorithms.
- Teaching assistant in physics courses on 13 semesters (6 different courses). Assistance in preparing lecture material.
- Supervised five summer students.

6/1993 - 7/1993, Institute of Industrial Automation, Helsinki University of Technology.

*Undergraduate research student.*

- Programming in Windows-environment: created a link from a Toolbook/Openscript - program to a SQL-database.

**Degrees:**

- 6/2001 Doctor of Science (Engineering) in physics, minor in computational dynamics, Helsinki University of Technology (thesis accepted with distinction).  
2/1997 Master of Science (Engineering) in physics, minor in mathematics, Helsinki University of Technology (thesis grade: 5/5).

**Languages:** Finnish (mother tongue), English (fluent), Swedish, and German.

**Technical skills:**

- Computer experience on several UNIX and Linux-platforms including massively parallel computers (Intel clusters, Cray T3D/E, SGI Origin 2000, Alpha workstations and clusters, IBM Blue).
- Tens of thousands of lines of scientific programming in Fortran and C, parallel programming with MPI and High Performance Fortran.
- Matlab, Mathematica, LaTeX, HTML, Xmgr, Bourne-shell, Emacs, etc.
- Programming in Windows-environment, SQL.

**References:**

Dr. Robert Rudd, Lawrence Livermore National Laboratory,  
Phone: +1 (925) 422-4292, E-mail: Robert.Rudd@llnl.gov

Dr. Mikko Alava, Helsinki University of Technology,  
Phone: +358-9-451 3104, E-mail: Mikko.Alava@hut.fi

Prof. Phillip Duxbury, Michigan State University,  
Phone: +1 (517) 355-9200, ext. 2301, E-mail: duxbury@pa.msu.edu

Dr. John Moriarty, Lawrence Livermore National Laboratory,  
Phone: +1 (925) 422-9964, E-mail: moriarty2@llnl.gov

Prof. Risto Nieminen, Helsinki University of Technology,  
Phone: +358-9-451 3105, E-mail: Risto.Nieminen@hut.fi

Dr. James Belak, Lawrence Livermore National Laboratory,  
Phone: +1 (925) 422-6061, E-mail: belak@llnl.gov

**Grants, awards, shortlistings:**

Obtained funding (US\$ 150 000) as the Principal Investigator in a LLNL Laboratory wide LDRD competition for studying polycrystalline fracture, 2003.

Selected for the shortlist of a lectureship position in the Physics Department & Center for Science at Extreme Conditions at the University of Edinburgh, UK, 2003.

The Best Dissertation of the year 2001 of the Department of Engineering Physics and Mathematics, Helsinki University of Technology, 4000 Fmk.

Vilho, Yrjö, and Kalle Väisälä Foundation, grant for post doc research, 10 000€, 2001.

The Finnish Cultural Foundation, grant for a conference trip, 25 000 Fmk, 2001.

Vilho, Yrjö, and Kalle Väisälä Foundation, grant for post doc research, 60 000 Fmk, 2000.

The Best Poster of Session 1S-Statistical Mechanics of Magnetism in the International Conference on Magnetism, ICM 2000, August 6-11<sup>th</sup> 2000, Recife, Brazil.

Alfred Kordelin Foundation, grant for a conference trip, 15 000 Fmk, 1998.

Vilho, Yrjö, and Kalle Väisälä Foundation, grant for a conference trip, 13 000 Fmk, 1997.

EU funded TMR/TRACS-programme in Edinburgh Parallel Computing Centre for three months in 1996 and for two months in 1997 at the University of Edinburgh.

#### **Referee:**

Physical Review Letters, Physical Review B, Physical Review E, Computational Materials Science.

#### **Memberships:**

American Physical Society, Finnish Physical Society, Materials Research Society.

#### **Publications in refereed journals:**

1. E. T. Seppälä, J. Belak, and R. E. Rudd, “Effect of stress-triaxiality on void growth in dynamic fracture of metals: a molecular dynamics study”, submitted to Physical Review B (cond-mat/0310541).
2. K. P. J. Kytölä, E. T. Seppälä, and M. J. Alava, “Elastic manifolds in disordered environments: energy statistics”, Europhysics Letters **62**, 35 (2003).
3. E. T. Seppälä, A. M. Pulkkinen, and M. J. Alava, “Percolation in Three-dimensional Random Field Ising Magnets”, Physical Review B **66**, 144403 (2002).
4. E. T. Seppälä and M. J. Alava, “Energy landscapes, lowest gaps, and susceptibility of elastic manifolds at zero temperature”, European Physical Journal B **21**, 407 (2001).
5. E. T. Seppälä, M. J. Alava, and P. M. Duxbury, “Extremal statistics in the energetics of domain walls”, Physical Review E **63**, 066110 (2001).

6. E. T. Seppälä and M. J. Alava, “Susceptibility and Percolation in 2d Random Field Ising Magnets”, *Physical Review E* **63**, 066109 (2001).
7. E. T. Seppälä, M. J. Alava, and P. M. Duxbury, “Intermittence and roughening of periodic elastic media”, *Physical Review E* **63**, 036126 (2001).
8. J. Rosti, L. I. Salminen, E. T. Seppälä, M. J. Alava, and K. J. Niskanen, “Pinning of Cracks in Two-dimensional Disordered Media”, *European Physical Journal B* **19**, 259 (2001).
9. E. T. Seppälä, M. J. Alava, and P. M. Duxbury, “Periodic elastic medium in which periodicity is relevant”, *Physical Review E* **62**, 3230 (2000).
10. E. T. Seppälä and M. J. Alava, “Energy Landscapes in Random Systems, Driven Interfaces and Wetting”, *Physical Review Letters* **84**, 3982 (2000).
11. E. T. Seppälä, Vilho I. Räsänen, and Mikko J. Alava, “Scaling of Interfaces in Brittle Fracture and Perfect Plasticity”, *Physical Review E* **61**, 6312 (2000).
12. K. J. Niskanen, M. J. Alava, E. T. Seppälä, and J. Åström, “Fracture Energy in Fiber and Bond Failure”, *Journal of Pulp and Paper Science* **25**, 167 (1999).
13. E. T. Seppälä, V. Petäjä, and M. J. Alava, “Disorder, Order, and Domain Wall Roughening in the 2d Random Field Ising Model”, *Physical Review E* **58**, R5217 (1998).
14. V. I. Räsänen, E. T. Seppälä, M. J. Alava, and P. M. Duxbury, “Quasi-Static Cracks and Minimal Energy Surfaces”, *Physical Review Letters* **80**, 329 (1998).
15. N. Provatas, M. Haataja, E. Seppälä, S. Majaniemi, J. Åström, M. Alava, and T. Ala-Nissilä, “Growth, Percolation and Correlations in Disordered Fibre Networks”, *Journal of Statistical Physics* **87**, 385 (1997).

#### Conference proceedings and other publications:

16. E. T. Seppälä, M. J. Alava, and I. J. Sillanpää, “Domain walls in random field Ising magnets: wetting”, *Journal of Magnetism and Magnetic Materials*, in press.
17. F. Ye, M. Matsuda, S. Katano, H. Yoshizawa, D. P. Belanger, J. A. Fernandez-Baca, E. T. Seppälä, and M. J. Alava, “Percolation fractal dimension in scattering line shapes of the random-field Ising model”, *Journal of Magnetism and Magnetic Materials*, in press.
18. E. T. Seppälä, James Belak, and Robert E. Rudd, “Molecular dynamics study of void growth and dislocations in dynamic fracture of FCC and BCC metals”, in *Dislocations, Plasticity and Metal Forming*, edited by Akhtar S. Khan (NEAT Press, Maryland, 2003).

19. James Belak, James U. Cazamias, David Haupt, John Kinney, Mukul Kumar, Roger Minich, Robert E. Rudd, Chris Schuh, Adam Schwartz, and Eira T. Seppälä, “The plastically deformed zone surrounding incipient voids in spallation fracture from 3D X-ray tomography, 2D microscopy and molecular dynamics simulation”, in *Dislocations, Plasticity and Metal Forming*, edited by Akhtar S. Khan (NEAT Press, Maryland, 2003).
20. E. T. Seppälä, J. Belak, and R. E. Rudd, “A Molecular Dynamics Study of the Effect of Triaxiality on Void Growth in Dynamic Fracture”, *Advances in Computational Engineering & Sciences*, in press.
21. N. Provatas, M. Haataja, E. Seppälä, S. Majaniemi, M. Alava, and T. Ala-Nissilä, “Structural Properties of Disordered Fibre Networks”, *Physica A* **239**, 304 (1997).
22. E. Seppälä, M. Alava, and K. Niskanen, “Paperin pinnan karheudesta” (“Can the Effect of Furnish be Detected in the Roughness of Handsheets”), *Paperi ja Puu* (Paper and Timber) **78**, 446 (1996).
23. E. T. Seppälä, J. Belak, and R. E. Rudd, “Three dimensional molecular dynamics study of coalescence of two voids in dynamic fracture of metals”, in preparation.

#### **Theses:**

Ph.D. Thesis (accepted with distinction), *Ground State Structure, Domain Walls, and External Field Response in Random Magnets*, (Helsinki University of Technology, 2001, ISBN 951-22-5458-1).

Master’s Thesis (grade: 5/5), *Scaling of Minimum Energy Interfaces*, (Helsinki University of Technology, 1996).

#### **Invited talks in conferences:**

“Molecular dynamics study of void growth and dislocations in dynamic fracture of FCC and BCC metals” in the Plasticity 2003, July 7-11<sup>th</sup> 2003, Québec City, Québec, Canada.

“Three-Dimensional Random Field Ising Magnets: Percolation and Domain Walls” in the ESF/Sphinx Workshop “Disordered systems at low temperatures and their topological properties”, January 17-20<sup>th</sup> 2002, Helsinki, Finland.

“Interfaces in Random Field Ising Systems” in the March Meeting 2001 of the American Physical Society, March 12-16<sup>th</sup> 2001, Seattle, Washington, USA.

“Serial and Parallel Maximum Flow-Minimum Cut Algorithms Applied to Random Bond and Random Field Ising systems”, Dagstuhl Seminar #01091, Algorithmic Techniques in Physics, February 25<sup>th</sup> - March 2<sup>nd</sup> 2001, Schloss Dagstuhl, Germany.

### **Seminar talks at institutions:**

“Coalescence of Two Voids in Dynamic Fracture of Metals: A Molecular Dynamics Study” in Postdoc Symposium, Lawrence Livermore National Laboratory, January 8<sup>th</sup>, 2004.

“Molecular dynamics study of void growth in dynamic fracture of metals” in the Physics Department, McGill University, Montreal, Canada, July 14<sup>th</sup> 2003.

”Stress Triaxiality in Void Growth” in Dynamics of Metals Seminar Series, Lawrence Livermore National Laboratory, June 23<sup>rd</sup> 2003.

“Fracture of ductile metals using molecular dynamics simulations” in the Physics Department, University of Edinburgh, UK, May 27<sup>th</sup>, 2003.

“Dynamic Fracture of Ductile Metals: Experiments and Modeling” at Laboratory of Physics, Helsinki University of Technology, Finland, May 22<sup>nd</sup>, 2003.

“Molecular Dynamics Study of Void Growth in Dynamic Fracture of Metals” in Physics and Advanced Technologies Post Doc Forum of Lawrence Livermore National Laboratory, April 15<sup>th</sup>, 2003.

“Molecular Dynamics Simulations of Void Growth in Dynamic Fracture of Metals: Effect of Triaxiality” at Department of Mechanical Engineering, Massachusetts Institute of Technology, USA, October 7<sup>th</sup> 2002.

“Percolation and Domain Walls in Random Field Ising Magnets” at Physics Department, University of California, Davis, USA, April 11<sup>th</sup> 2002.

“Dynamic Fracture in Metals: Plasticity at the Atomistic Scale” at Laboratory of Physics, Helsinki University of Technology, Finland, January 14<sup>th</sup> 2002.

“Ground State Structure and Domain Walls in Random Field Magnets” at Physics Department, University of California, Santa Cruz, USA, March 30<sup>th</sup> 2001.

“Ground State Structure and Domain Walls in Random Field Magnets” at Lawrence Livermore National Laboratory, USA, March 23<sup>rd</sup> 2001.

“Ground State Interfaces in Random Systems” at Department of Physics and Astronomy, Michigan State University, USA, September 2<sup>nd</sup> 1999.

“Minimum Energy Surfaces in Parallel” at Edinburgh Parallel Computing Centre, University of Edinburgh, UK, March 30<sup>th</sup> 1996.

### **Contributed talks in conferences:**

“Molecular Dynamics Simulations of Void Growth in Dynamic Fracture of FCC and BCC metals” in the Materials Research Society Spring Meeting, April 21<sup>st</sup>-24<sup>th</sup> 2003, San Francisco, California, USA.

“Molecular Dynamics Simulations of Void Growth in Dynamic Fracture of FCC and BCC metals” in the March Meeting 2003 of the American Physical Society, March 3<sup>rd</sup>-7<sup>th</sup> 2003, Austin, Texas, USA.

“Percolation Transitions in 2D and 3D RFIM and DAFF” in the March Meeting 2003 of the American Physical Society, March 3<sup>rd</sup>-7<sup>th</sup> 2003, Austin, Texas, USA.

“A Molecular Dynamics Study of the Effect of Triaxiality on Void Growth in Dynamic Fracture” in the International Conference on Computational Engineering & Sciences, ICES '02, July 31<sup>st</sup> - August 2<sup>nd</sup> 2002, Reno, Nevada, USA.

“Universality in Ground State Energy Distributions of Random Elastic Manifolds” in the March Meeting 2002 of the American Physical Society, March 11-15<sup>th</sup> 2002, Indianapolis, Indiana, USA.

“Dynamic Fracture in Metals: Effect of Triaxiality on Plasticity” in the March Meeting 2002 of the American Physical Society, March 11-15<sup>th</sup> 2002, Indianapolis, Indiana, USA.

“Domain Walls in Random Magnets: Wetting and External Field Response” in the 21st IUPAP International Conference on Statistical Physics, STATPHYS21, July 15<sup>th</sup>-21<sup>st</sup> 2001, Cancún, México.

“Extended Criticality in the 2d Random Field Ising Magnets” in the International Conference on Magnetism, ICM 2000, August 6-11<sup>th</sup> 2000, Recife, Brazil.

“Susceptibility of the 2d Random Field Ising Model” in the Ising Centennial Colloquium, a Satellite Meeting to ICM 2000, August 1<sup>st</sup>-4<sup>th</sup> 2000, Belo Horizonte, Brazil.

“Extended Criticality in the 2d Random Field Ising Model” in the March Meeting 2000 of the American Physical Society, March 20-24<sup>th</sup> 2000, Minneapolis, Minnesota, USA.

“Extended Criticality in the 2d Random Field Ising Model” in the 34<sup>th</sup> Annual Conference of the Finnish Physical Society, March 9-11<sup>th</sup> 2000, Espoo, Finland.

“Behavior of an Interface in a Field” in the Centennial Meeting of the American Physical Society, March 20-26<sup>th</sup> 1999, Atlanta, Georgia, USA.

“Behavior of an Interface in a Field” in the 33<sup>rd</sup> Annual Conference of the Finnish Physical Society, March 4-6<sup>th</sup> 1999, Turku, Finland.

“Order, Disorder, and Roughening in the 2d RFIM” in the Workshop on Classical and Quantum Aspects of Disorder, August 7-8<sup>th</sup> 1998, Jyväskylä, Finland.

“First Order Transitions in Wetting and Glassy Energy Landscapes” in the 12<sup>th</sup> Nordic Symposium on Computer Simulation, June 10-14<sup>th</sup> 1998, Jyväskylä, Finland.

## Poster presentations:

“Susceptibility of Domain Walls in Random Magnets” in the International Conference on Magnetism, ICM 2000, August 6-11<sup>th</sup> 2000, Recife, Brazil.

“Energy Landscapes in Random Systems, Driven Interfaces and Wetting” in the 18<sup>th</sup> General Conference of the Condensed Matter Division of the European Physical Society “EPS-CMD 18”, March 13-17<sup>th</sup> 2000, Montreux, Switzerland.

“Energy Landscapes in Random Systems, Driven Interfaces and Wetting” in the Nordita Workshop on Nonequilibrium Physics, September 23<sup>rd</sup>-25<sup>th</sup> 1999, Copenhagen, Denmark.

“A Surprise in the 2D Random Field Ising Model at  $T = 0$ : A Percolation Phase” in the 22nd International Conference on Low Temperature Physics, “LT22”, August 4-11<sup>th</sup> 1999, Espoo and Helsinki, Finland.

“Percolation in the 2d Random Field Ising model” in the Middle European Cooperation in Statistical Physics, “MECO 24”, March 8-10<sup>th</sup> 1999, Lutherstadt Wittenberg, Germany.

in the 1998 Conference on Computational Physics, September 2<sup>nd</sup>-5<sup>th</sup> 1998, Granada, Spain.

in the XXth IUPAP International Conference on Statistical Physics, STATPHYS20, July 20-25<sup>th</sup> 1998, Paris, France.

in the Satellite Meeting to STATPHYS 20: “Applications of Field Theory to Statistical Physics: Soft Condensed Matter, Non-Equilibrium and Boundary Critical Phenomena”, July 15-18<sup>th</sup> 1998, Bonn, Germany.

in the 32<sup>nd</sup> Annual Conference of the Finnish Physical Society, March 19<sup>th</sup>-21<sup>st</sup> 1998, Tampere, Finland.

in the International Summer School on Fundamental Problems in Statistical Mechanics IX, August 15-28<sup>th</sup> 1997, Altenberg, Germany.

in the International Workshop of Structurally Disordered Systems, February 14-16<sup>th</sup> 1997, Jyväskylä, Finland.

in the 29<sup>th</sup> Annual Conference of the Finnish Physical Society, March 16-18<sup>th</sup> 1995, Jyväskylä, Finland.

## Summer schools, visits for research, etc.:

Invited participation in 2<sup>nd</sup> International Workshop “Multiscale Modeling of Strength and Fracture: Linking through the Mesoscale”, Berkeley, California, USA, January 7-9<sup>th</sup>, 2004.

Visit for research at the University of California, Santa Cruz, USA, March 16-30<sup>th</sup>, 2001.



Visit for research at the Michigan State University, USA 8.-17.8.1996, 19.-23.5., 27.9.-9.10.1997, 12.8.-10.9.1999, 27.3.-25.4.2000 (total three months).

The “Methods Meet: Physics and Topical Issues of Society” Symposium, November 4-5<sup>th</sup> 1999, NORDITA, Denmark. Participation in a panel discussion.

The 8<sup>th</sup> International Summer School on Classical and Quantum Aspects of Disorder, August 3<sup>rd</sup>-6<sup>th</sup> 1998, Jyväskylä, Finland.

Visit for research at NORDITA, Denmark 24.2.-3.3., 21.-28.4., 3.12.-8.12.1997, 31.3.-3.4.1998.

Graduate Course on the Physics of Random Systems, lectured by Professor Amnon Aharony and Professor Ora Entin-Wohlman, February 9-27<sup>th</sup>, April 13-17<sup>th</sup>, and June 15-20<sup>th</sup> 1998, University of Oslo, Norway.

Visit for research in parallel computing in physics, EU funded TMR/TRACS-programme in Edinburgh Parallel Computing Centre, March 3<sup>rd</sup> - May 17<sup>th</sup> 1996 and March 3<sup>rd</sup> - April 21<sup>st</sup> 1997 at the University of Edinburgh, UK (total five months).

The 5<sup>th</sup> International Summer School on Many-Body Physics, August 14-25<sup>th</sup> 1995, Jyväskylä, Finland.

### **Teaching experience:**

Teaching assistant in Physics I and Physics II for 'Chemical Technology', 'Forest Products Technology', and Open University students, four semesters.

Teaching assistant in Physics I and Physics II for 'Materials Science and Rock Engineering' and 'Computer Science and Engineering' students, five semesters.

Teaching assistant in Physics I and Physics II for English speaking students, four semesters.

Assistance in preparing the lecture material for the courses Physics I and Physics II for English speaking students.

Supervised five summer students, of which three wrote a special assignment.